



V M A S C

virtual reality

> simulation on
> elapsed time
= 10 msec.
> simulation on
> searching for the
> ready
defined pattern
> ok
> found 2 items

loading...

M&S Research and Education at VMASC

R. Bowen Loftin, Ph.D.

Executive Director, Virginia Modeling, Analysis &
Simulation Center

Professor of Electrical and Computer Engineering

Professor of Computer Science

Graduate Program Director

Graduate Programs in Modeling and Simulation



*The Discipline of
M&S*



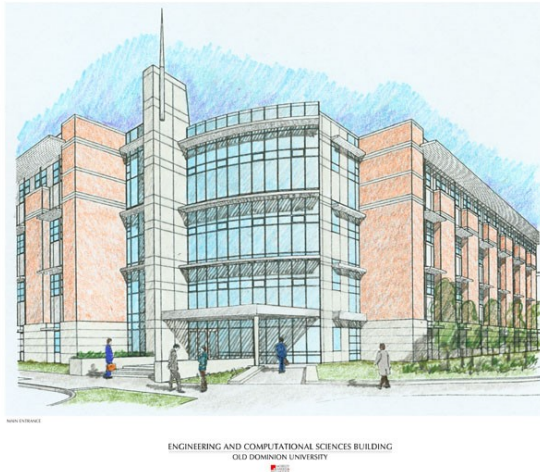
INTRODUCTION



Virginia Modeling, Analysis & Simulation Center

- Enterprise Center, Batten College of Engineering & Technology, Old Dominion University
- Home of Old Dominion University's Graduate Programs in Modeling and Simulation
- Established July 1997 by the Commonwealth of Virginia
- Locations in Suffolk (TCC-Portsmouth) and ODU Norfolk Campus

INTRODUCTION



- Faculty/Staff: 57 research scientists and staff plus over 50 students and 10 faculty
- Multidisciplinary: activities include faculty and students from all six academic colleges at ODU
- Strong collaborative ties to other universities, government laboratories, and the private sector

MISSION

- Engage in collaborative research and development in Modeling and Simulation (M&S) and in Visualization
- Develop the M&S workforce through education
- Provide M&S technical expertise to government and industry
- Stimulate technology-related economic development in Hampton Roads and the Commonwealth of

OUTREACH

We employ a 'Value-Added Proposition' approach to aid our partners in expanding their knowledge of and opportunities in Modeling & Simulation.

**160
MEMBERS**

10 Academic

15 Affiliate

24

Government

112 Industry





VMASC Leadership Team

✓ **R. BOWEN LOFTIN, PhD**

EXECUTIVE DIRECTOR

Phone: 757 686-6200

E-mail: bloftin@odu.edu

✓ **MIKEL D. PETTY, PhD**

CHIEF SCIENTIST

Phone: 757 686-6210

E-mail: mpetty@odu.edu

✓ **CAPT KEVIN McCLESKEY, USNR**
(ret)

OPERATIONS DIRECTOR

Phone: 757 686-6206

E-mail: kmcclesk@odu.edu

✓ **MARK SCERBO, PhD**
HF RESEARCH DIRECTOR

Phone: 757 683-4217

E-mail: mscerbo@odu.edu

✓ **ROLAND R. MIELKE, PhD**

TECHNICAL DIRECTOR

Phone: 757 686-6211

E-mail: rmielke@odu.edu

✓ **MARK PHILLIPS, ME**
BATTLE LAB DIRECTOR

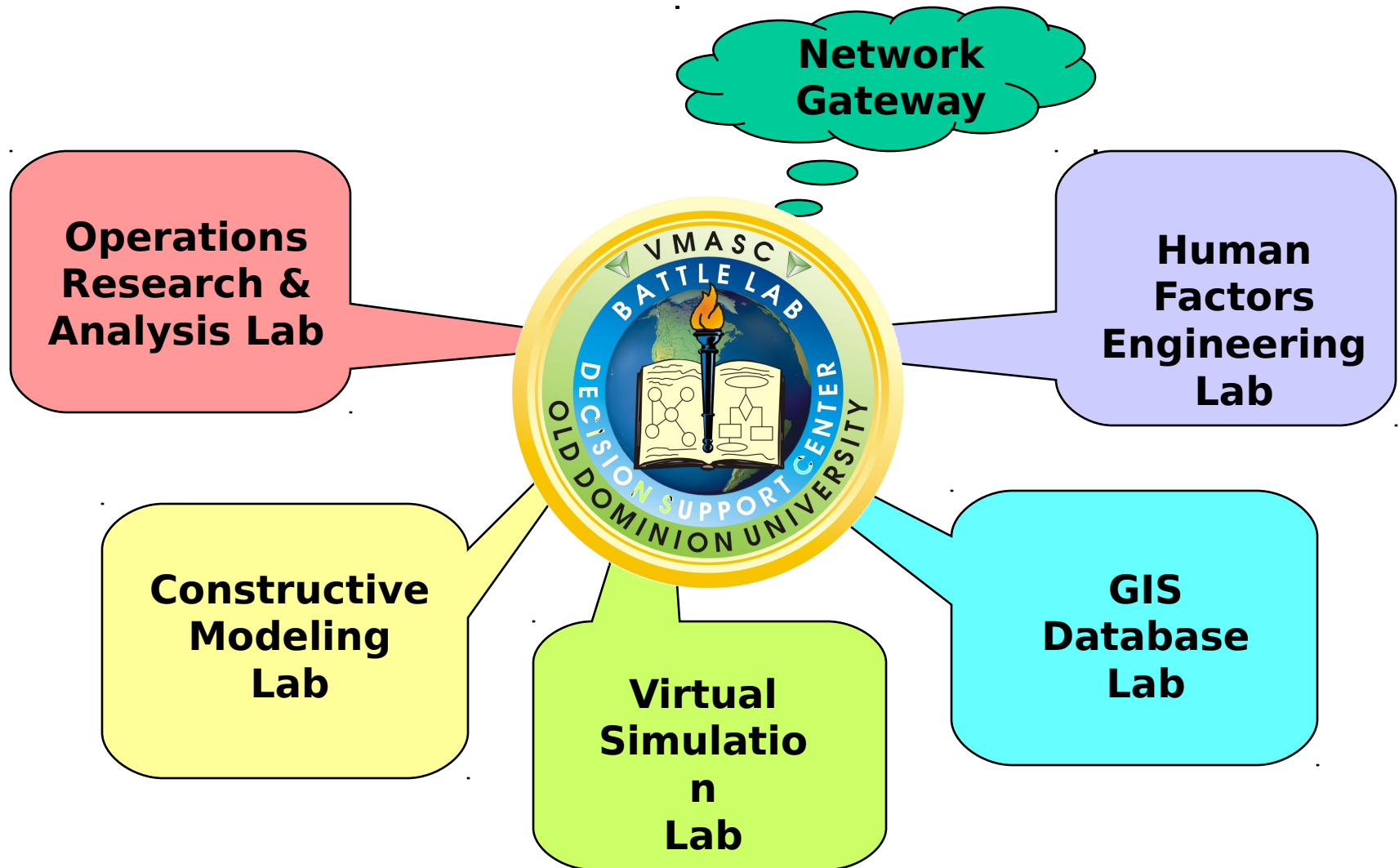
Phone: 757 686-6200

E-mail: mphillip@odu.edu

VMASC Senior Researchers

- ✓ **Nathan Bailey, PhD**
Psychology
Human Factors
Training Development
- ✓ **Jessica Crouch, PhD**
Computer Science
Finite Element Modeling
Medical Simulation
- ✓ **Wes Colley, PhD**
Physics
Physics-Based Simulation
Agent-Based Simulation
- ✓ **Dave Dryer, PhD**
Industrial Engineering
Systems Modeling
Collaborative Environments
- ✓ **Ryland Gaskins, PhD**
Psychology
Human Factors
Human Behavioral Modeling
- ✓ **Yuzhong Shen, PhD**
Computer Science
Visualization
Software Engineering
- ✓ **John Sokolowski, PhD**
Modeling & Simulation
Human Decision Modeling
Large-Scale Simulations
- ✓ **Andreas Tolk, PhD**
Computer Science
C4ISR-Simulation Integration
Distributed Simulation

VMASC Battle Lab



M&S Graduate Program Philosophy

- Prepare individuals to support domain experts in increasing their capabilities and knowledge through the use of modeling and simulation tools and methodologies
- Prepare experts and researchers in the discipline and science of modeling and simulation
- Create new knowledge

Program Characteristics

- Multi- and Interdisciplinary (supported by faculty from ten academic departments across five colleges)
- A strong, common foundation core
- Flexibility to design a plan of study to meet each individual's objectives and needs
- Thesis/Dissertation topics of relevance to employers

MS/ME Program

- Core
 - Introduction to M&S (MSIM 601)
 - Computer Science for M&S (MSIM 602)
 - Systems Modeling (ECE 605)
 - Introduction to Discrete Event Simulation (ECE 505)
 - Human Computer Interfaces (PSY 662)
- 9 or 12 hours of electives
- Master's Thesis (6 hours) or Capstone Project course (3 hours)

PhD Program

- Master's coursework (up to 24 hours)
- Core
 - Advanced Discrete Systems Simulation (MSIM 810)
 - Foundations for Continuous and Real-Time Simulation (MSIM 820)
 - Simulation Modeling Theory and Formalisms (MSIM 830)
 - Ph.D. Seminar Advanced Simulation Systems (MSIM 888)
- 12 hours of electives
- 24 hours of dissertation research

ODU M&S Graduate Programs

- Master of Science/Master of Engineering in Modeling and Simulation
 - Originally developed by Jack Stoughton (ECE)
 - Approved in 1998
 - Fall 2004 enrollment is 55 (25 MS/30 ME)
 - 34 graduates as of Summer, 2004
 - Offered via distance learning (*e.g.*, Naval Surface Warfare Center, Dahlgren Division; NAVAIR Patuxent River)

ODU M&S Graduate Programs

- Doctor of Philosophy in Engineering with a Concentration in Modeling & Simulation
 - Developed by Ralph Rogers (EMSE) and Bowen Loftin
 - Approved in 2000
 - Fall 2004 enrollment is 45.
 - First graduate in May, 2003 [CAPT John Sokolowski, USN (ret)]
 - Some core courses now being offered via distance learning

Selected Dissertation/Thesis Topics

- Dissertation Topics
 - Modeling the Decision Process of a Joint Task Force Commander (J. Sokolowski)
 - Models, Composability and Validity (E. Weisel)
 - A Model Framework for the Representation of Cohesion in Combat Models (W. Warner)
 - A Methodology for Complex System Visualization Interfaces (H. Berbesi)
 - A Methodology for the Interoperability of Models (J. Mugira)

Selected Dissertation/Thesis Topics

- Functional Decomposition and Synthesis as a Methodology for the Evaluation of Simulations (A. Hoover)
- Is Twisting the View Better? (R. King)
- Thesis Topics
 - The Development of An Enterprise Supply Chain Model for Naval Warship Construction (R. Wallen)
 - Functional Model of the Army's System Training Plan (STRAP) Generation Process: Transitioning to a Knowledge-Base Enterprise (B. Hartzog)

More Information

- www.vmasc.odu.edu (select “Education”)
- Ms. Deborah Robillard
 - Program Coordinator
 - [757-686-6224](tel:757-686-6224)
 - drobilla@odu.edu

Core Competencies

- Foundations of Modeling and Simulation
- Modeling Human Behavior
- Next Generation Distributed Simulation
- Collaborative Engineering
- Systems Modeling
- Live-Virtual-Constructive Integration
- Visualization
- Technology Assessment
- Education and Training
- VV&A; Test & Evaluation of Simulations

VMASC Research & Development

Virginia Modeling Analysis & Simulation
Center

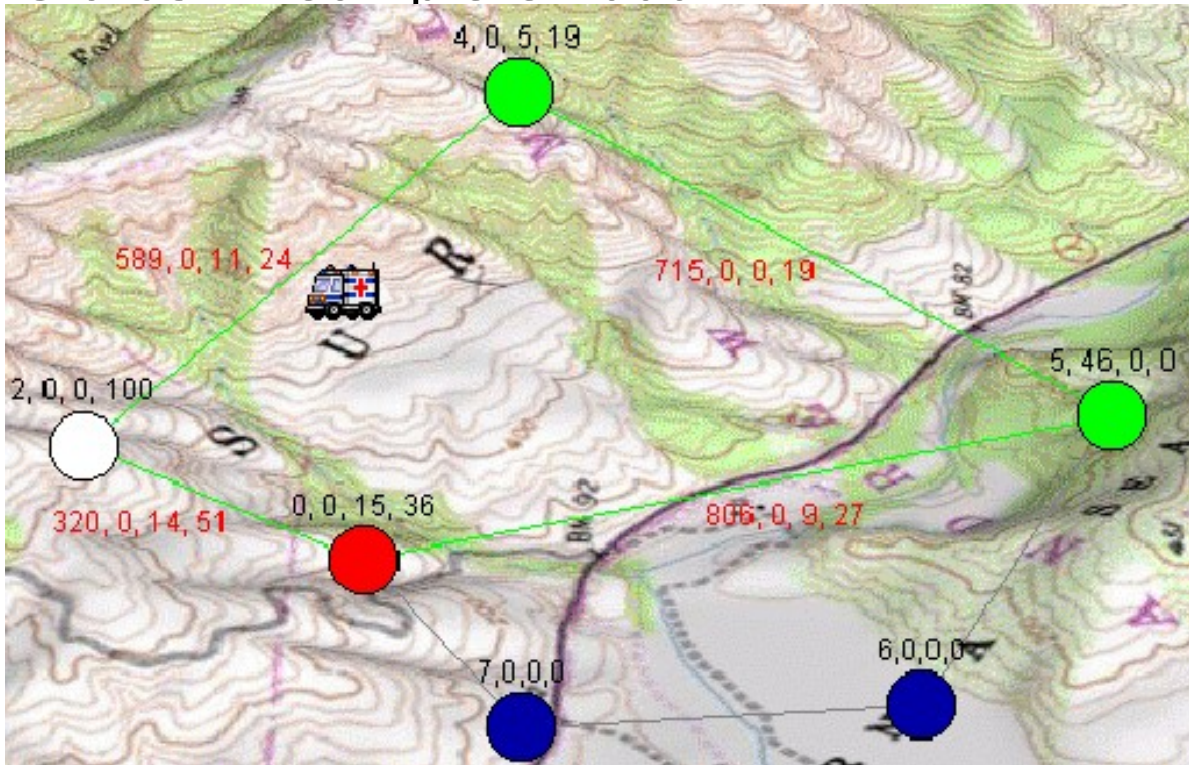
Frank Batten College of Engineering and
Technology



n U



Title: **Personality Effects on Decision Making**
 Project: Develop model of command decision making affected by commander personality traits; test in relief scenario
 Sponsor: VMASC IR&D
 Status: Complete 2000



Traits

1. Stability
2. Anxiety
3. Anger
4. Humor
5. Acquiescence
6. Independence
7. Charisma
8. Knowledge

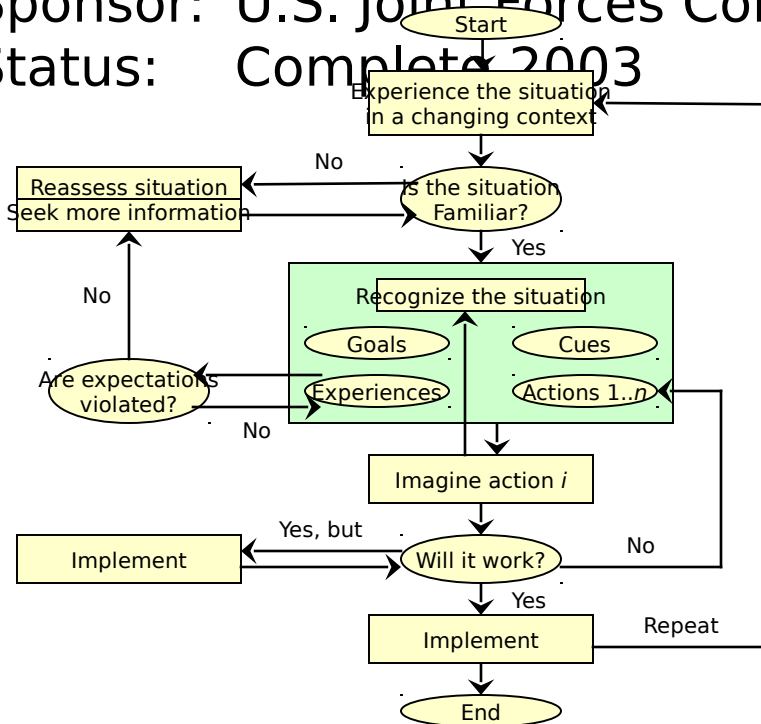
Title: **Modeling the Decision Making of the Joint Task Force Commander**

Project: Develop automated model of Joint Task Force Commander

decision making; compare model and human decisions

Sponsor: U.S. Joint Forces Command; DMSO

Status: Complete 2003



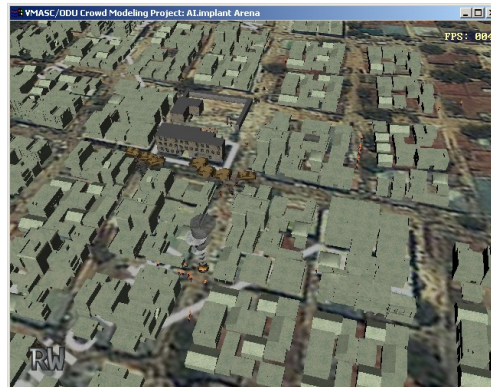
Title: **Crowd Modeling**

Project: Develop simulation of crowd behavior in military scenarios, with psychologically-based behavior model; interoperable

with military simulations (JSAF, JCATS) via HLA

Sponsor: Defense Modeling and Simulation Office

Status: Current



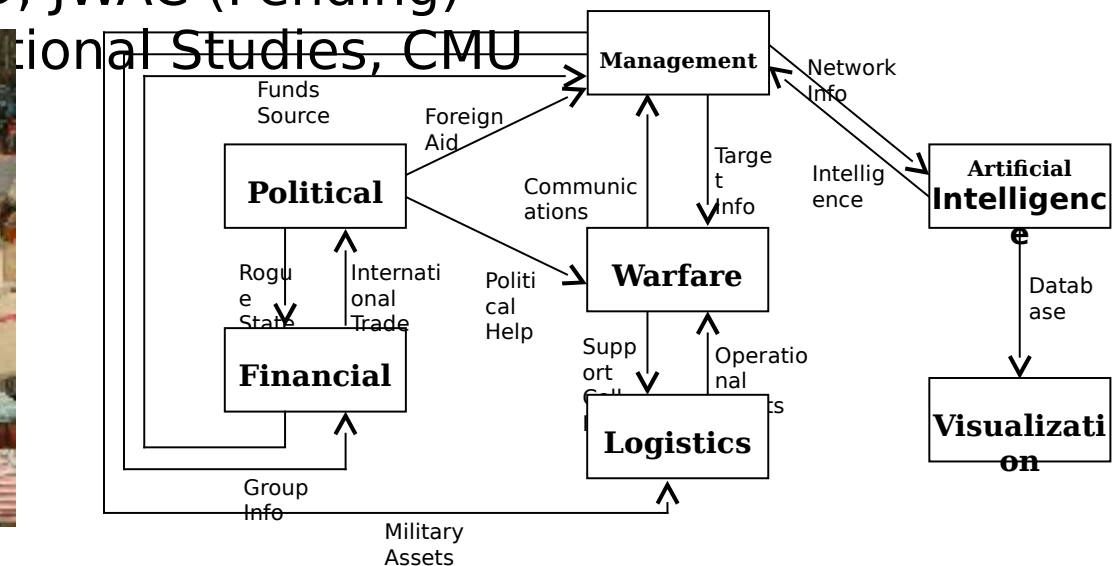
Title: **Effects-Based Operations: Modeling Cultural, Economic, Political, and Psychological Effects**

Project: Develop models that support the prediction of effects along

cultural, economic, political, and psychological dimensions

in support of effects-based operations against an adversary

Sponsor: VMASC IR&D; JWAC (Pending)



Title: **Virtual Environments for Training**

Project: Develop shared real-time virtual environment toolkit for

rapid generation of OOTW training scenarios

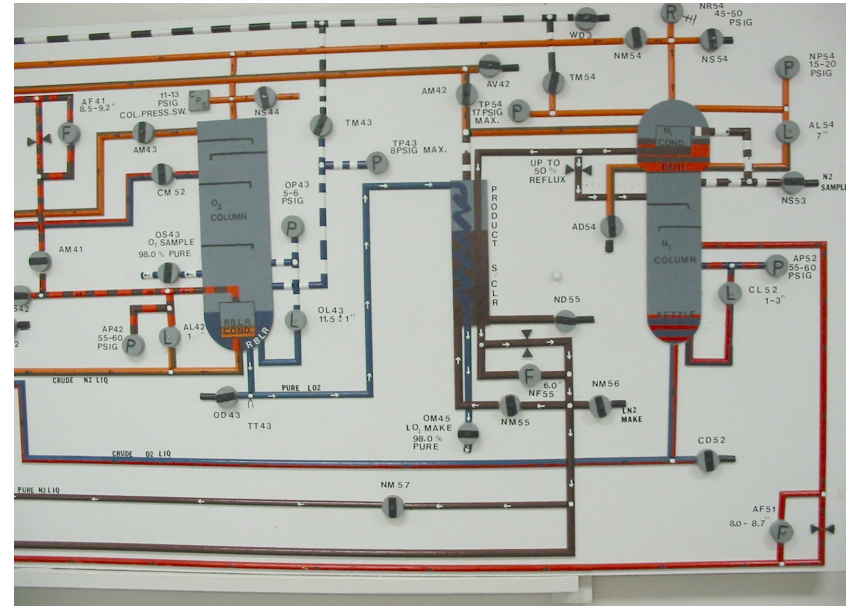
Sponsor: U.S. Navy Office of Naval Research

Partners: University of Houston; University of Pennsylvania; LinCom

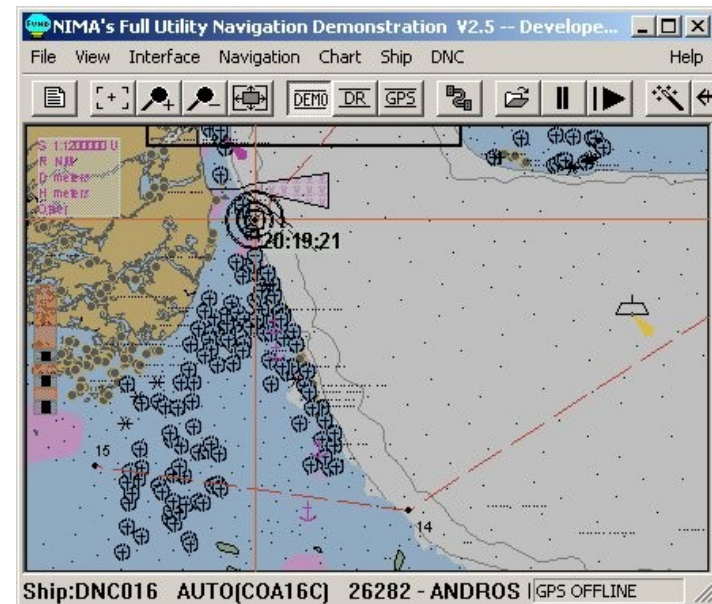
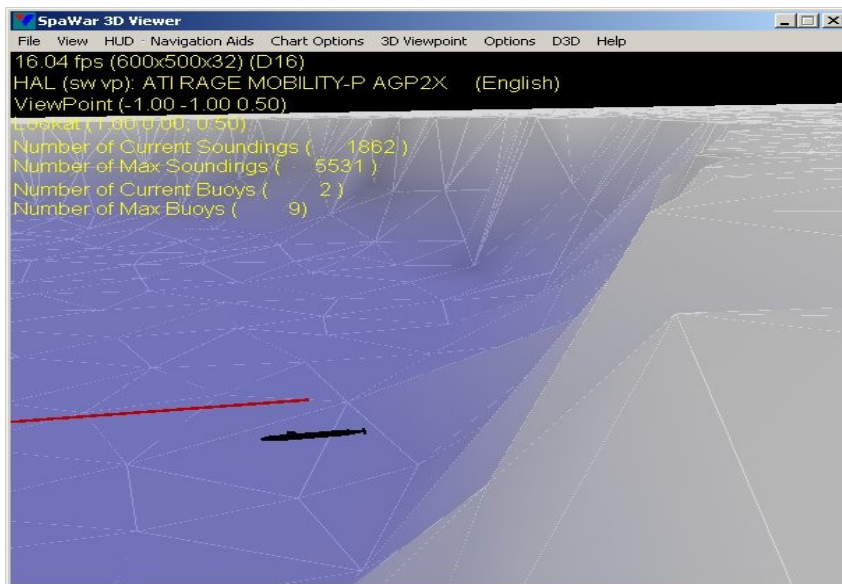
Status: Complete 2002



Title: **Cryogenics Training Course Enhancement 2**
 Project: Develop computer visualizations and animations to support live classroom instruction on oxygen/nitrogen producer systems
 Sponsor: U.S. Navy Center for Naval Engineering
 Status: Complete 2004



Title: **2D/3D Navigation Visualization**
 Project: Develop functional prototype for integrated 2D/3D navigation visualization tool, using DNC depth data; display includes terrain and navigation aids
 Sponsor: U.S. Navy SPAWAR
 Partner: WR Systems
 Status: Complete 2001



Title: **Virtual Campaign Management System**
Project: Perform requirements analysis, systems analysis,
and system design for VCMS, a capability to
coordinate
and manage the Joint experimentation process
Sponsor: U.S. Joint Forces Command
Status: Complete 2003



Title: **Joint National Training Capability
(Advanced Training Technology)**

Project: Design and prototype the Joint Advanced Training
Technology Laboratory

Sponsor: U.S. Joint Forces Command

Status: Current

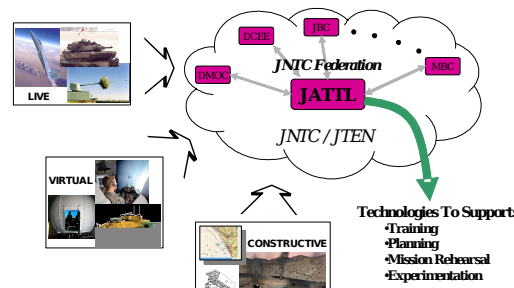
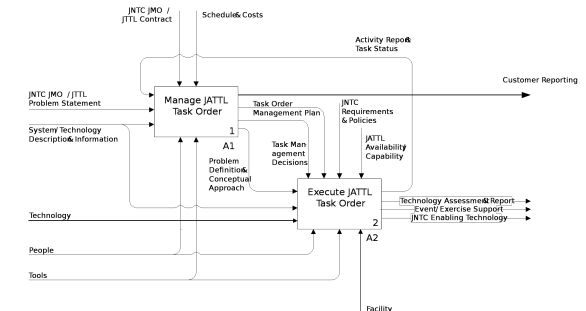
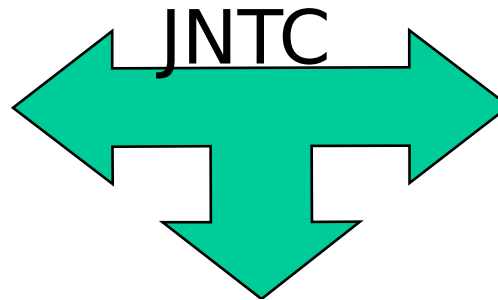
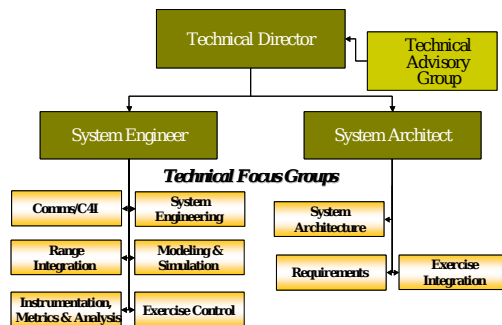
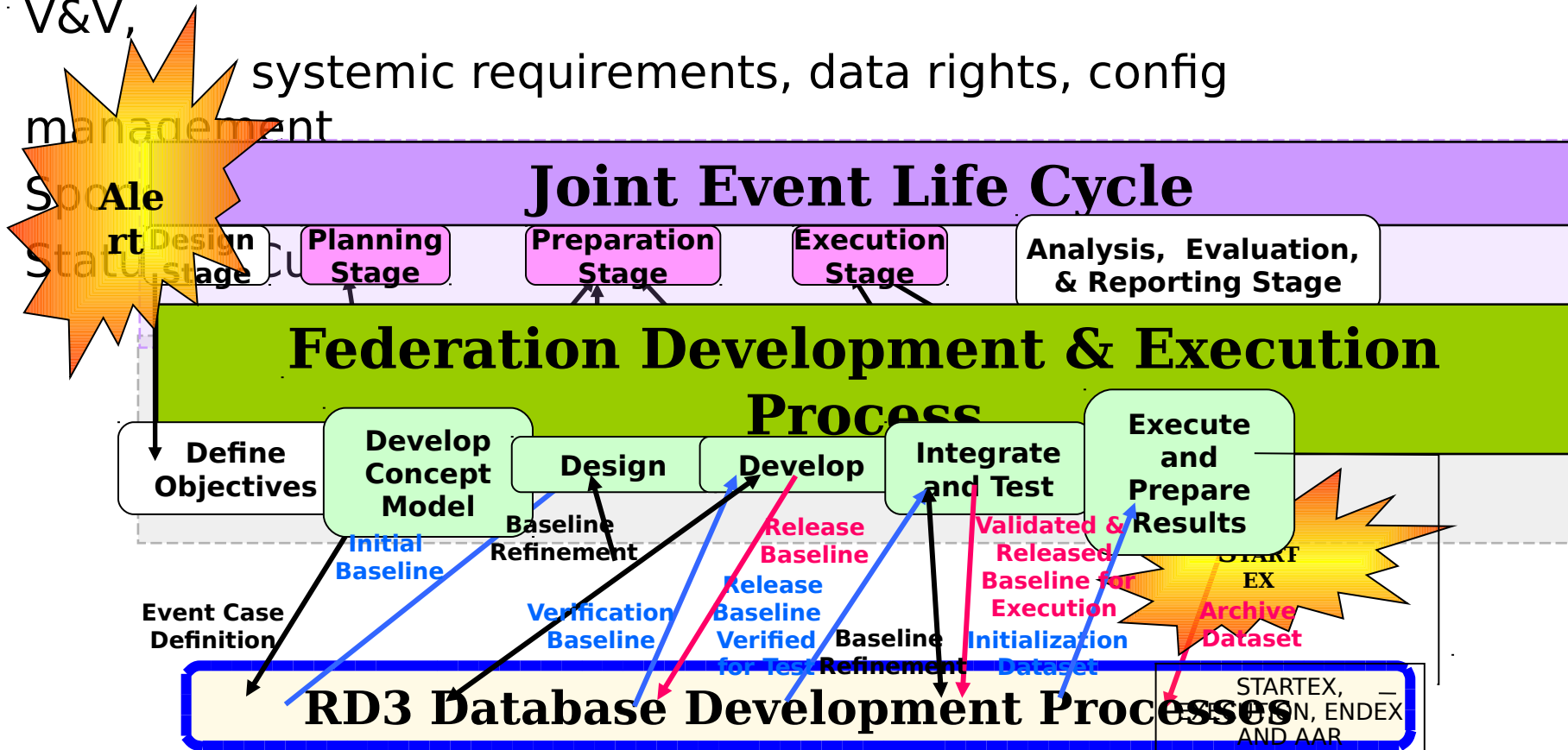


Figure 1. OV-1 JATIL Concept Depiction

Title: **JNTC Rapid Distributed Database Development Support**

Project: Life Cycle IPT lead for JNTC RD3 Initiative, including V&V,

systemic requirements, data rights, config management



Title: **Joint National Training Capability (JNTC) Rapid Distributed Database Development (RD3) Life Cycle Support**

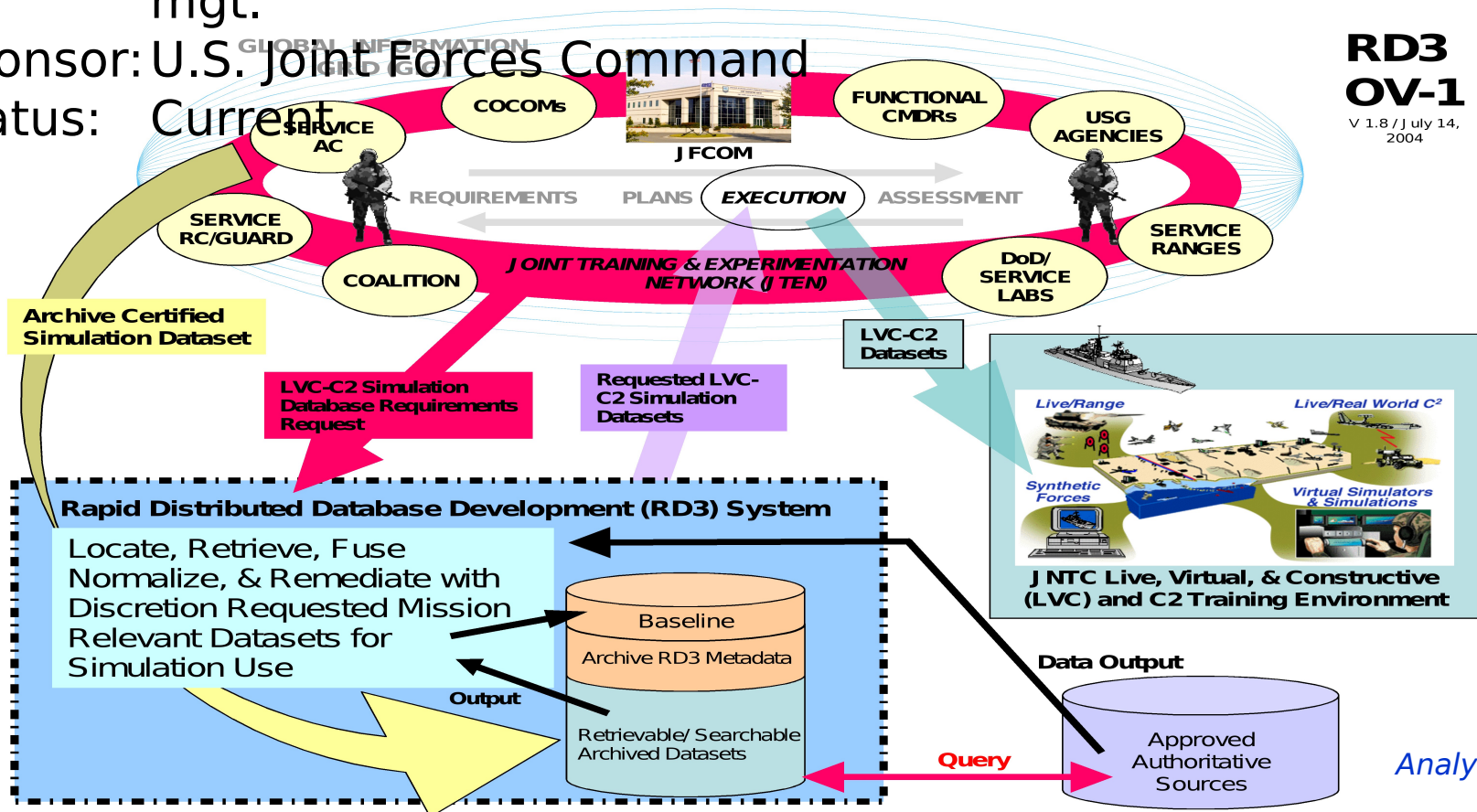
Project: Life Cycle IPT lead for JNTC RD3 Initiative, including V&V, systemic requirements, data rights, and configuration mgt.

Sponsor: U.S. Joint Forces Command

Status: Current

**RD3
OV-1**

V 1.8 / J ully 14,
2004



Title: **Modeling and Simulation for Homeland Defense**

Project: Develop and demonstrate a simulation capability that

supports the training, analysis, and decision support requirements of state and local emergency

managers

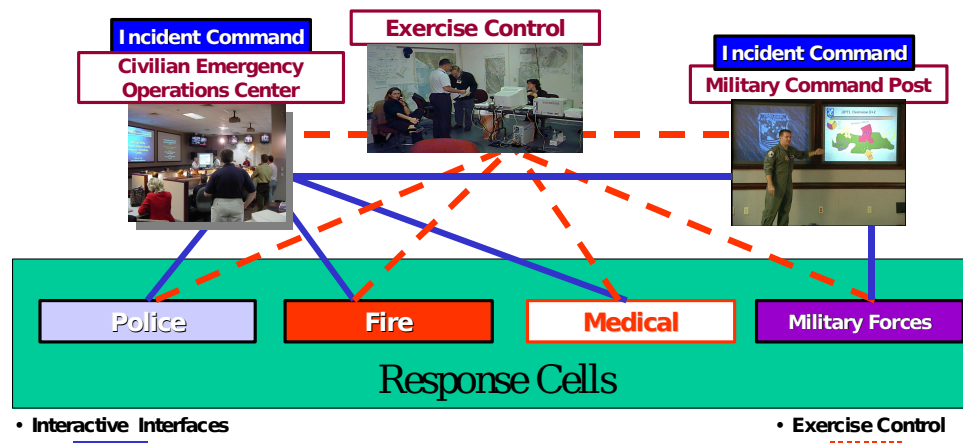
Sponsor: U.S. Joint Forces Command

Partners: Eleven industry and academic partners

Status: Current

Conceptual Training Event Model

Simulation, 'stimulates' the Emergency Operations Center, Command Post and Incident Command Teams



Title: **Joint BattleSpace Environment/JNTC
Prototyping**

Project: Establish persistent JBE federation at VMASC Battle Lab

Sponsor: U.S. Joint Forces Command

Status: Complete

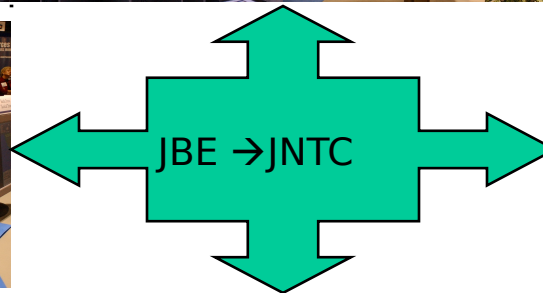
Integrated



Live



C4I



Constructive



Virtual

Title: **Synthetic Environments for Analysis and Simulation**

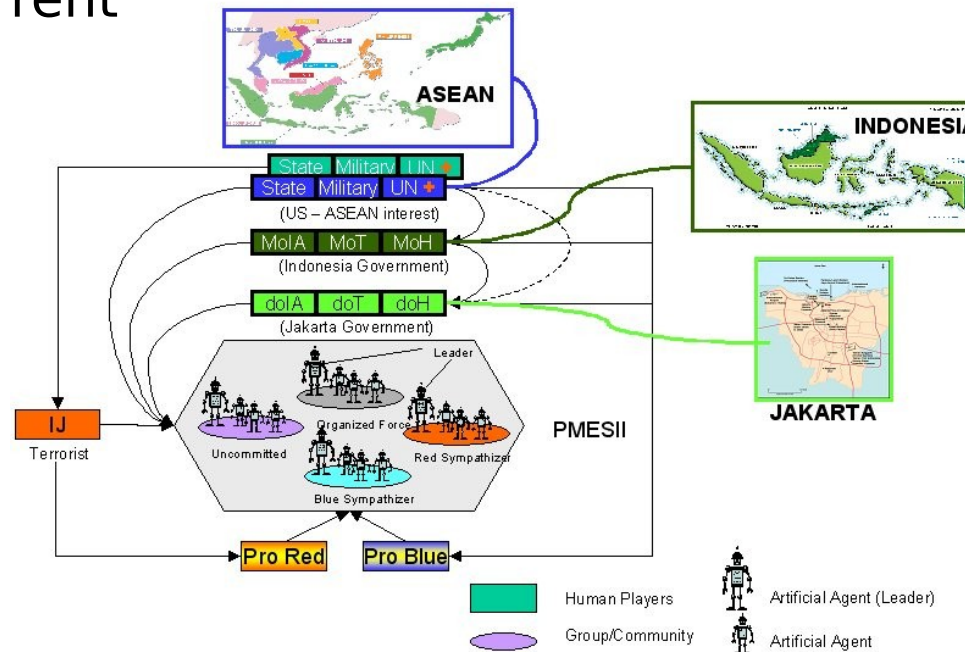
Project: Develop an agent-based model of political, military, economic, social information, and infrastructure of an urban area for Joint Urban Operations analysis.

Sponsor: U.S. Joint Forces Command

Partner: Purdue University

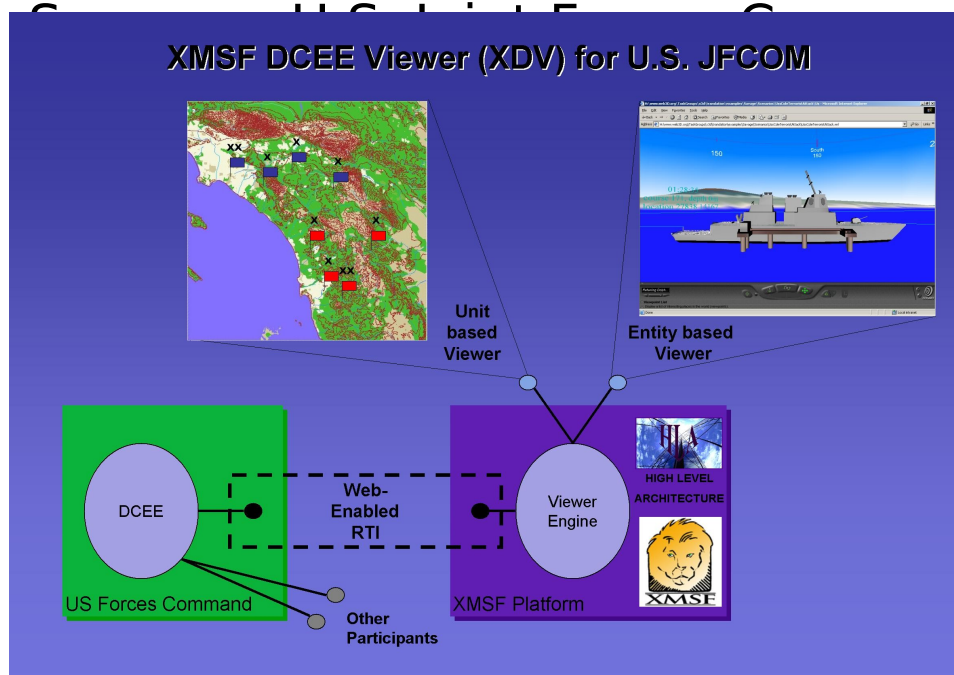
Status: Current

The Game board



Title: **XMSF DCEE Viewer**

Project: Develop an open standard based Viewer for the Distributed Continuous Experimentation Environment (DCEE) of the U.S. Joint Forces Command Experimentation Directorate



The XMSF DCEE Viewer (XDV)

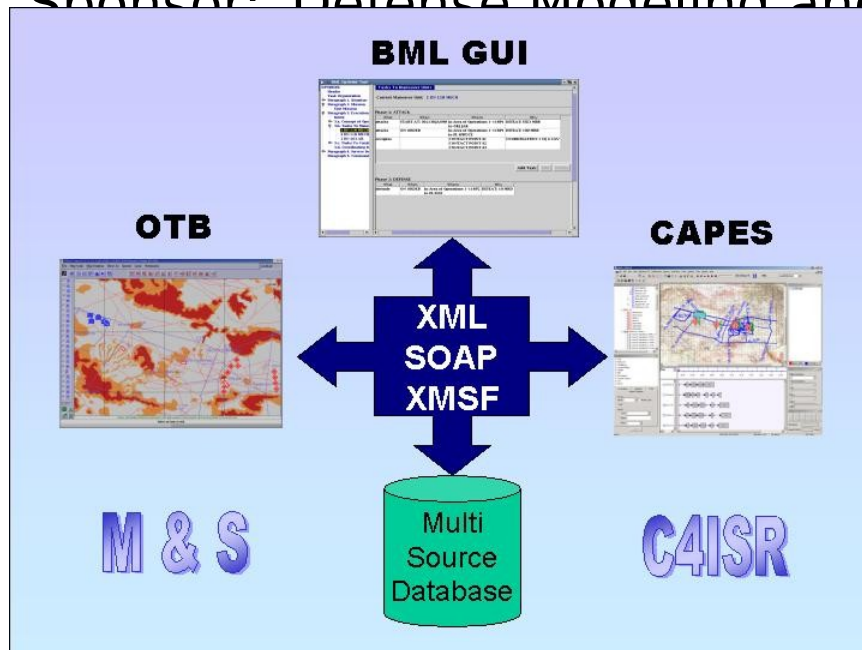
- Runs on Commercial-off-the-Shelf (COTS) PCs,
- Uses web-based protocols to display the actual situation within the DCEE federation
- Can be used by eligible DCEE users wherever an Internet-connection is available
- Comprises the Web-Enabled RTI, an Entity Based Viewer, and a Unit Based Viewer

Title: **XMSF C4I Test Bed / XMSF Battle Management Language**

Project: Transfer the Army Project Battle Management Language

to a joint and combined solution based on open standards

Sponsor: Defense Modeling and Simulation Office
CS, Alion



BML is the unambiguous representation of doctrine applicable for C4ISR, M&S, and robotics

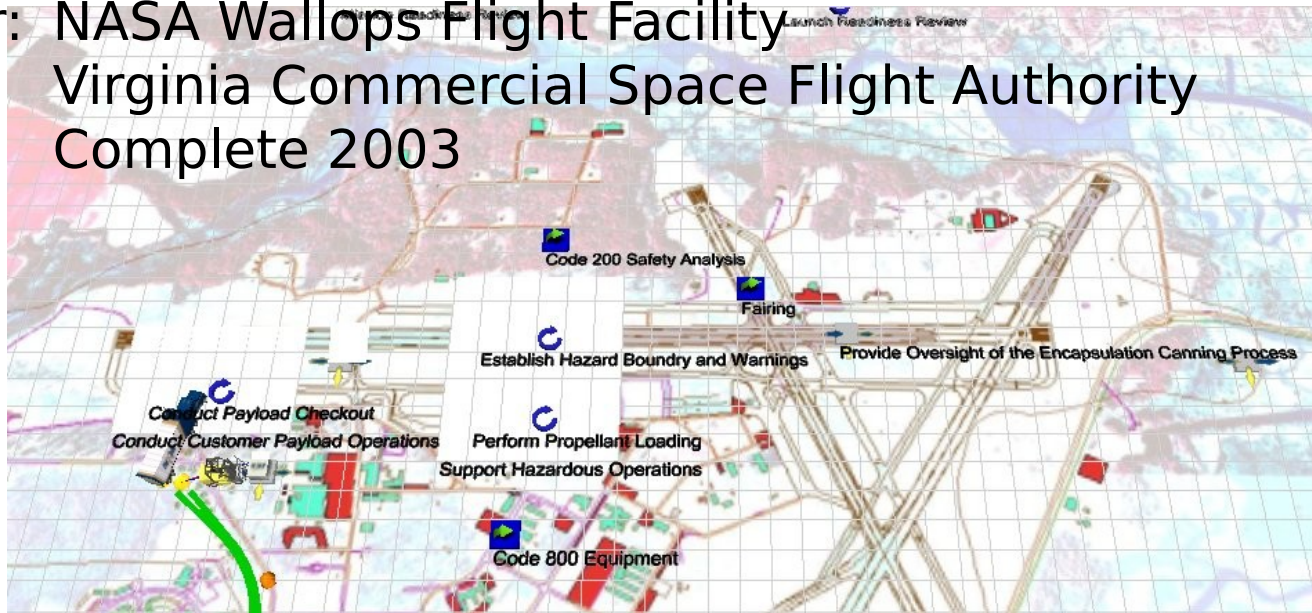
Title: **Rapid Response Launch Modeling and Simulation**

Project: Develop an initial M&S capability for rapid response launch missions; development of a process prototype model;
refinement and modeling of knowledge capture;
in-depth analysis of a sample data module

Sponsor: NASA Wallops Flight Facility

Partner: Virginia Commercial Space Flight Authority

Status: Complete 2003



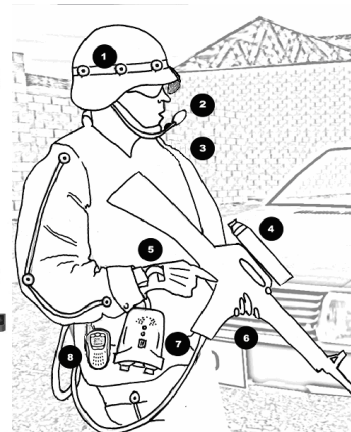
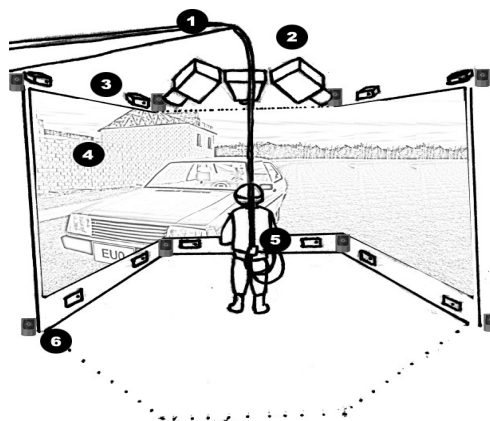
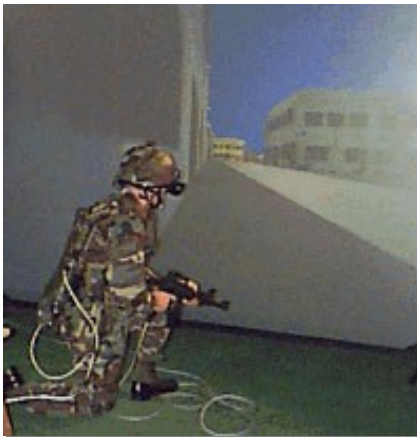
Title: **Soldier CATT Rapid Response Immersive Technology Assessment**

Project: Assess the expected state of immersive technology available FY 06 that could be in Soldier CATT

Sponsor: U.S. Army Research Institute

Partner: MYMIC LLC

Status: Complete 2004



Title: Naval Collaborative Engineering Environment (NCEE) Effects-based Modeling and Simulation Integration

Project: Develop a technical strategy and implementation plan

to introduce and integrate an effects-based M&S capability

into the NCEE System Engineering Test

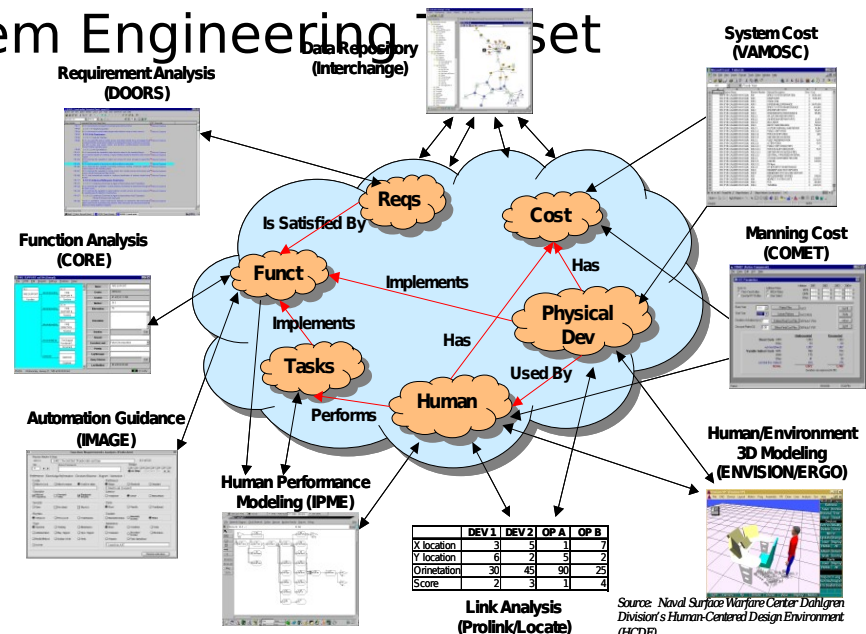
Sponsor: U.S. Navy

Status: Complete 2004

Effects-based M&S



RDA
CHIEF
ENGINEER

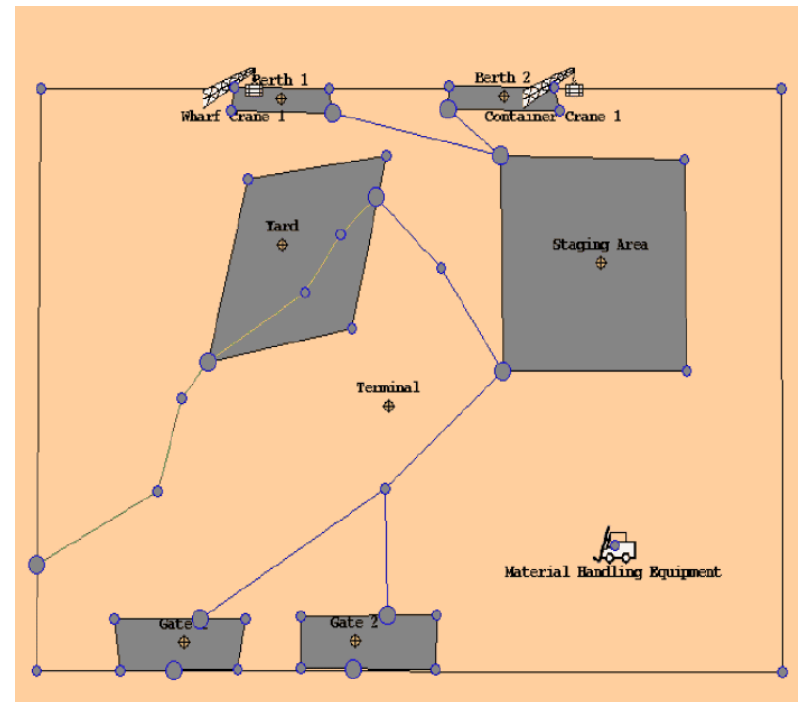
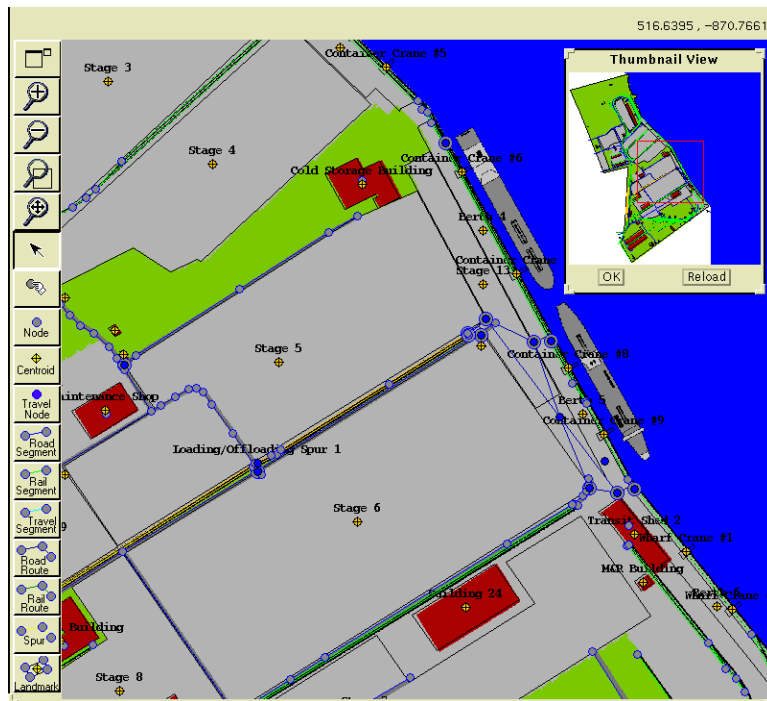


Title: **CPortS**

Project: Enhance and validate time-stepped, discrete event, stochastic simulation of port operations

Sponsor: Surface Deployment and Distribution Command

Status: Current



Title: **JOFT Validation**

Project: Validate JFCOM-developed model of logistics transportation and sustainability feasibility; perform SME assessment and operational validation

Sponsor: U.S. Joint Forces Command

Status: Complete 2004

Feasibility Analysis - Microsoft Internet Explorer provided by 39

Address: http://172.16.4.58:8080/sustain?

File Edit View Favorites Tools Help

TPFDD Baseline Duration Days 15 Days Remaining 30 Calc Bal. Day Required 15 Bal. Day Percent 200 Risk Factor (1-5) 2 Calc Replenish Rate (1-5) 4 Calc Time Phased Analysis View Post-Sust. Trans. Analysis View Post-Sust. Motion Analysis View

1 MEF

Class	Wgt. Factor	Orig. Base Qty.	Avail. Qty.	[A] Cons. Rate (No. of Users)	[B] Cons. Rate (per Day / per User)	A + B	Bal. Req. past Orig. Qty.	Bal. Qty.	Sustain Req.	Sus. Wgt. Factor
1	0	19180	19180	23	63	1288	19320	0	19320	0.00
2	0	32232	32232	7	10	62	930	0	930	0.00
3	0	37761	37761	40	75	2667	40805	0	40805	0.00
4	0	23795	23795	25	100	2222	33330	0	33330	0.00
5	0	15747	15747	48	84	3584	53760	0	53760	0.00
6	0	31771	31771	29	42	1083	16245	0	16245	0.00
7	0	25205	25205	40	6	256	3840	0	3840	0.00
8	0	15139	15139	39	96	3326	49920	0	49920	0.00
9	0	43428	43428	28	1	25	375	0	375	0.00
10	0	12381	12381	14	94	1170	17550	0	17550	0.00

1 OBC: Afloat (a)

Class	Wgt. Factor	Orig. Base Qty.	Avail. Qty.	[A] Cons. Rate (No. of Users)	[B] Cons. Rate (per Day / per User)	A + B	Bal. Req. past Orig. Qty.	Bal. Qty.	Sustain Req.	Sus. Wgt. Factor
1	1	11498	11498	1	85	76	1140	0	1140	0.10
2	1	36268	36268	45	18	720	10800	0	10800	0.30
3	1	49257	49257	5	13	58	870	0	870	0.02
4	1	19974	19974	43	60	2293	34395	0	34395	1.72
5	1	22172	22172	59	21	1101	16515	0	16515	0.74
6	1	18177	18177	30	96	2560	38400	0	38400	2.11

Feasibility Analysis - Microsoft Internet Explorer provided by 39

Address: http://172.16.4.58:8080/feas?td=15&side=notout&time=yes&id=300&f=20&v=16&w=217+0.00&w=187+3.94

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Preview Print Edit Discuss

Address: http://172.16.4.58:8080/feas?td=15&side=notout&time=yes&id=300&f=20&v=16&w=217+0.00&w=187+3.94

Joint Operations Feasibility Tool

JOFT

Feasibility Analysis:

PRI	Unit Name	PAX	STONS	PDE Date	POD	POD Date	Lift	Pass/Fail
1	1 MEF							
	Loading 1 of 1 of 1 MEF at 1 day							
	In Transit 1 of 1 of 1 MEF at 1 day							
	Arrived POD of 1 MEF at 1 day and 12 hours							
	Checking MOG 1 of 1 of 1 MEF at 1 day and 12 hours							
	1 OBC: Afloat (a)							
	Loading 1 of 25 of 1 OBC: Afloat (a) at 2 days							
	Loading 2 of 25 of 1 OBC: Afloat (a) at 2 days							
	Loading 3 of 25 of 1 OBC: Afloat (a) at 2 days							
	Loading 4 of 25 of 1 OBC: Afloat (a) at 2 days							
	Priority 1, 1 MEF Failed! Priority 2, 1 OBC: Afloat (a) Failed!							

Top

Log Out

Title: **JSIMS Operational Testing Support**

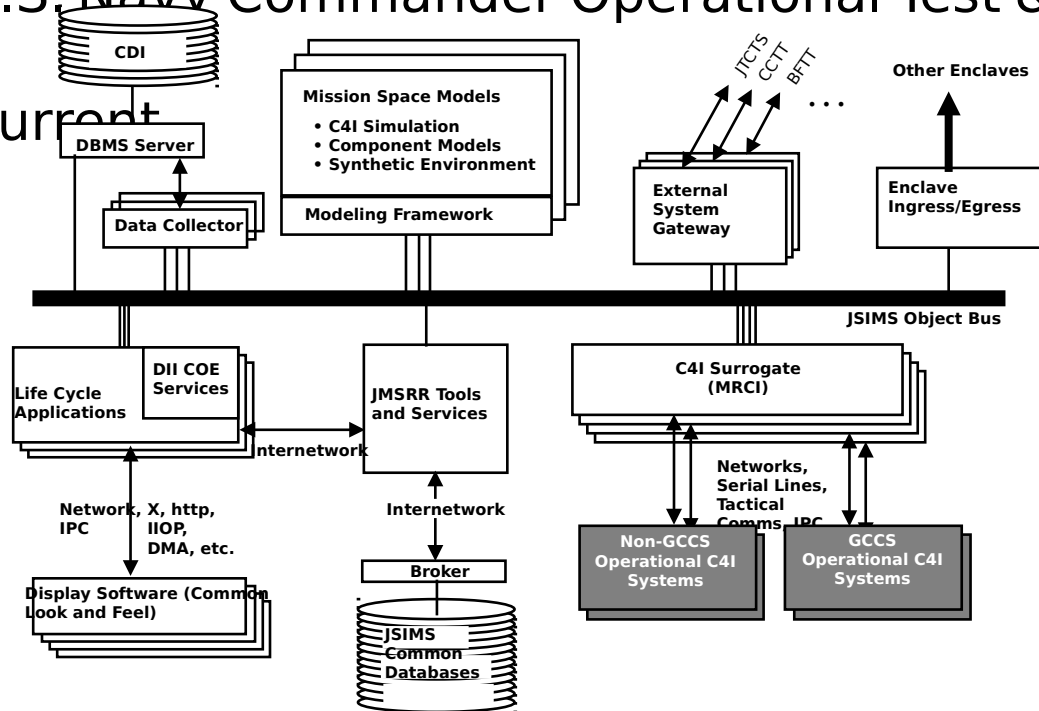
Project: Support operational testing of JSIMS by COMOPTEVFOR;

consult on simulation testing methodologies;
develop test criteria and scenario events to cover

req'ts

Sponsor: U.S. Navy Commander Operational Test & Evaluation Force

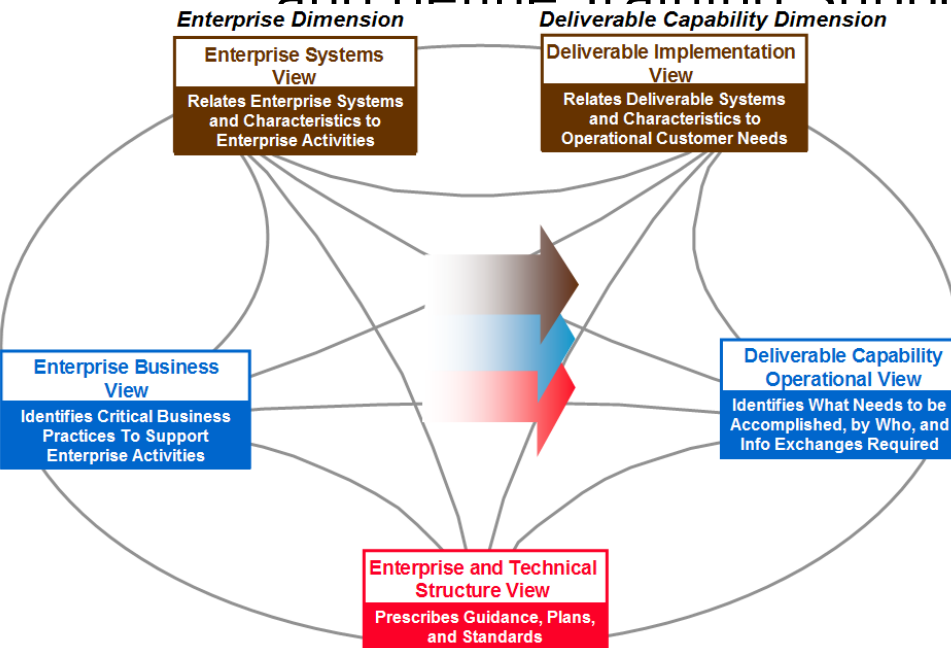
Status: Current



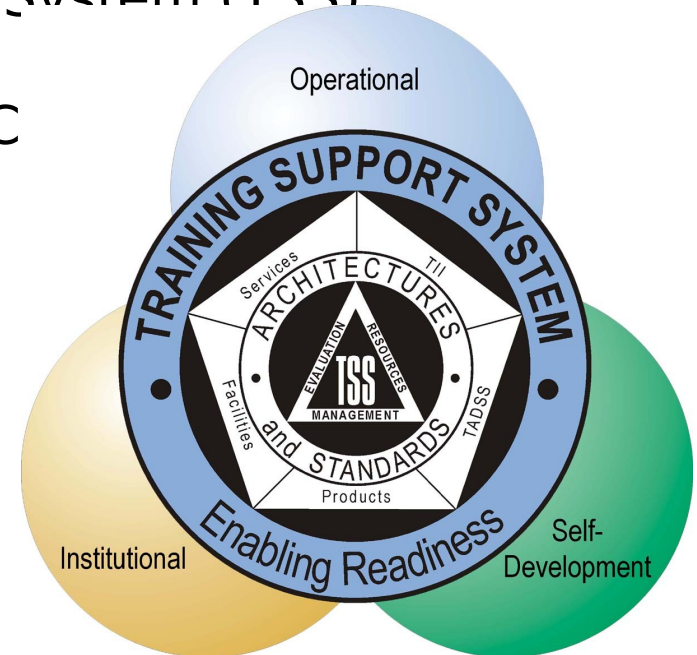
Title: **Front-End Analysis for a Virtual Training Support System of Systems (VTS3)**

Project: Architecture modeling and visualization to explain the comprehensive system of systems nature of training support

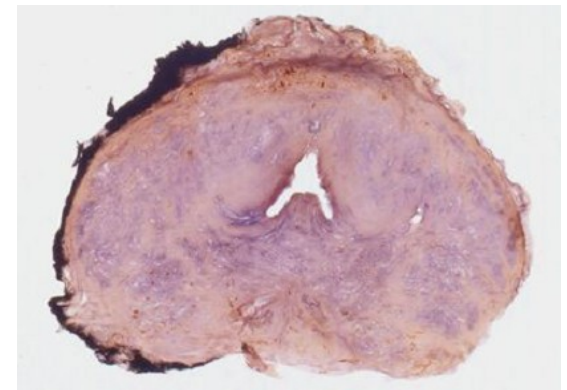
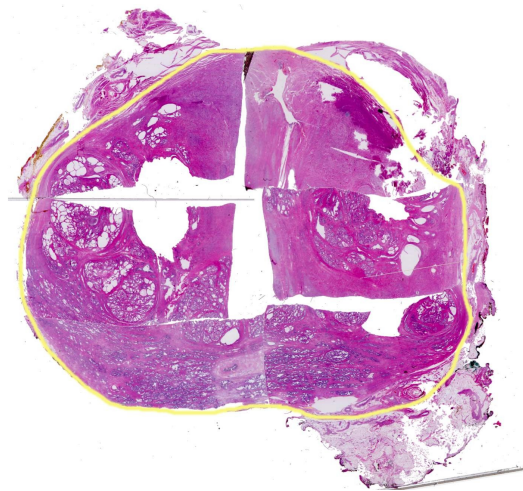
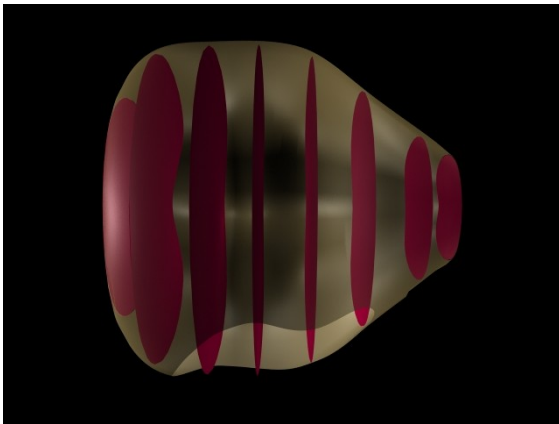
and define Training Support System (TSS)



t C



Title: **Quantifying Prostate Surgery Success**
Project: Compare prostate removal success rates of open vs. laparoscopic surgery by visualization and quantification of fatty tissue coverage
Sponsor: Eastern Virginia Medical School
Partner: Eastern Virginia Medical School
Status: Current



Title: **Medical M&S: Simulator Evaluation**

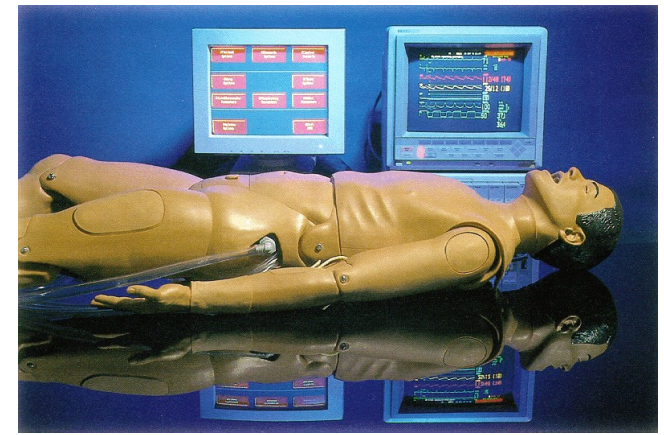
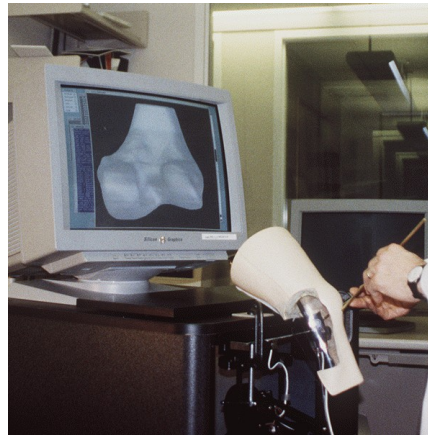
Project: Conduct training transfer studies of medical simulators;

investigate applicable simulation technologies

Sponsors: TATRC; Naval Health Research Center; ONR

Partners: EVMS, USUHS (NCAMSC), NMC Portsmouth

Status: Current



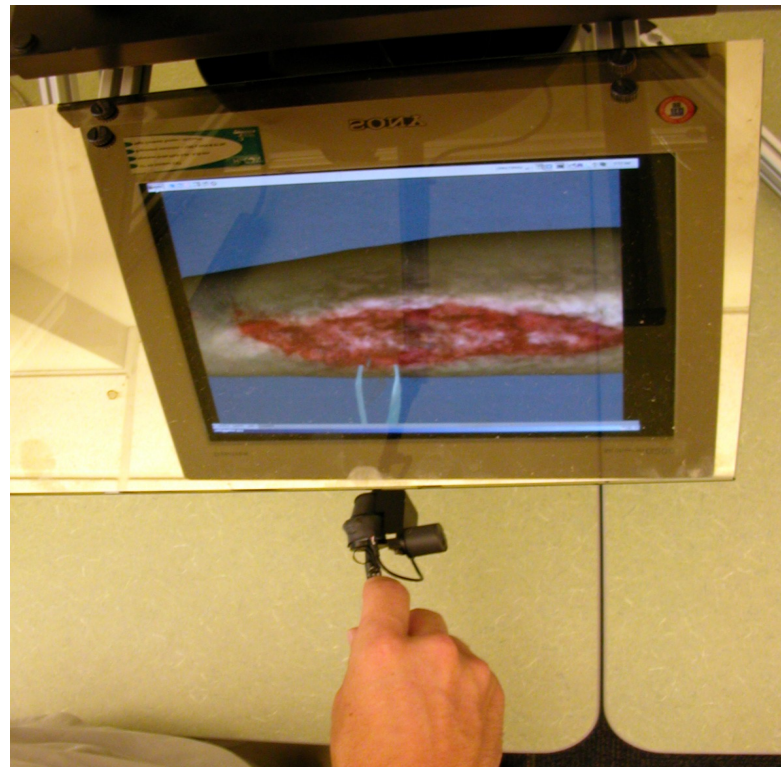
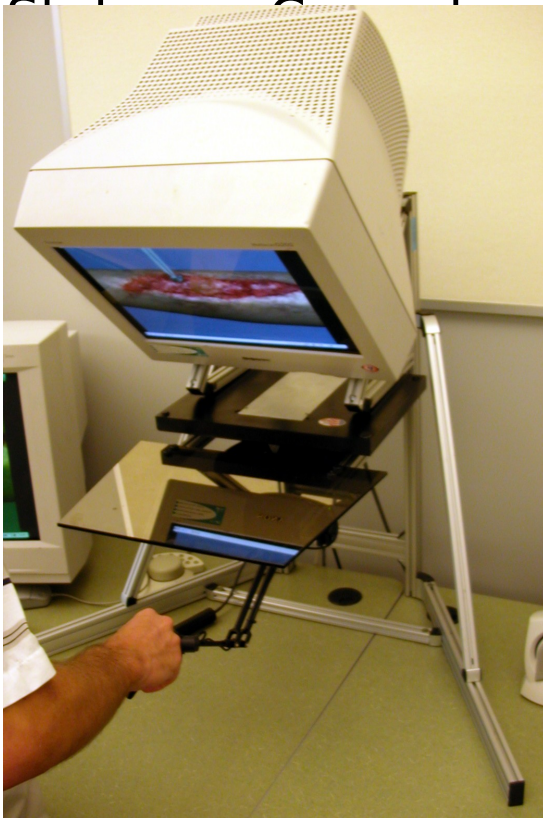
Title: **Medical M&S: Simulator Development**

Project: Develop new simulators that support training and planning

for the treatment of of trauma wounds

Sponsors: TATRC; Naval Health Research Center; ONR

Partner: Eastern Virginia Medical School

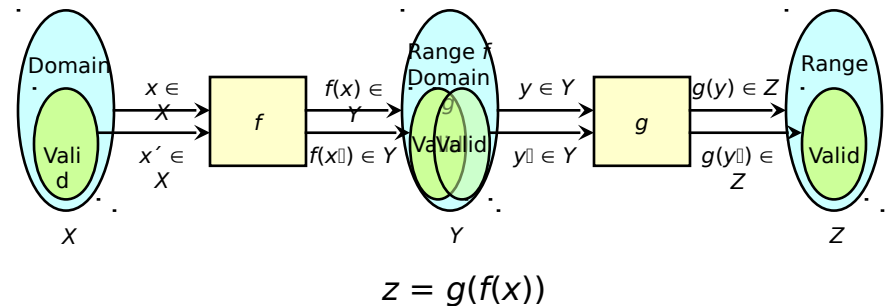
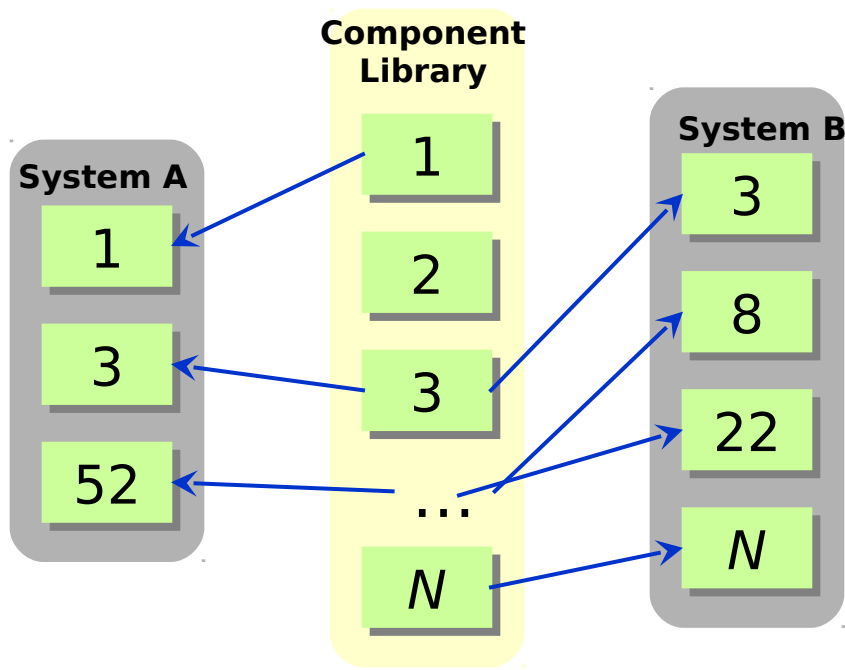


Title: **Composability Theory**

Project: Develop theory of semantic composability of models based on computability theory and mathematical logic

Sponsors: DMSO; U.S. Navy Office of Naval Research

Status: Current

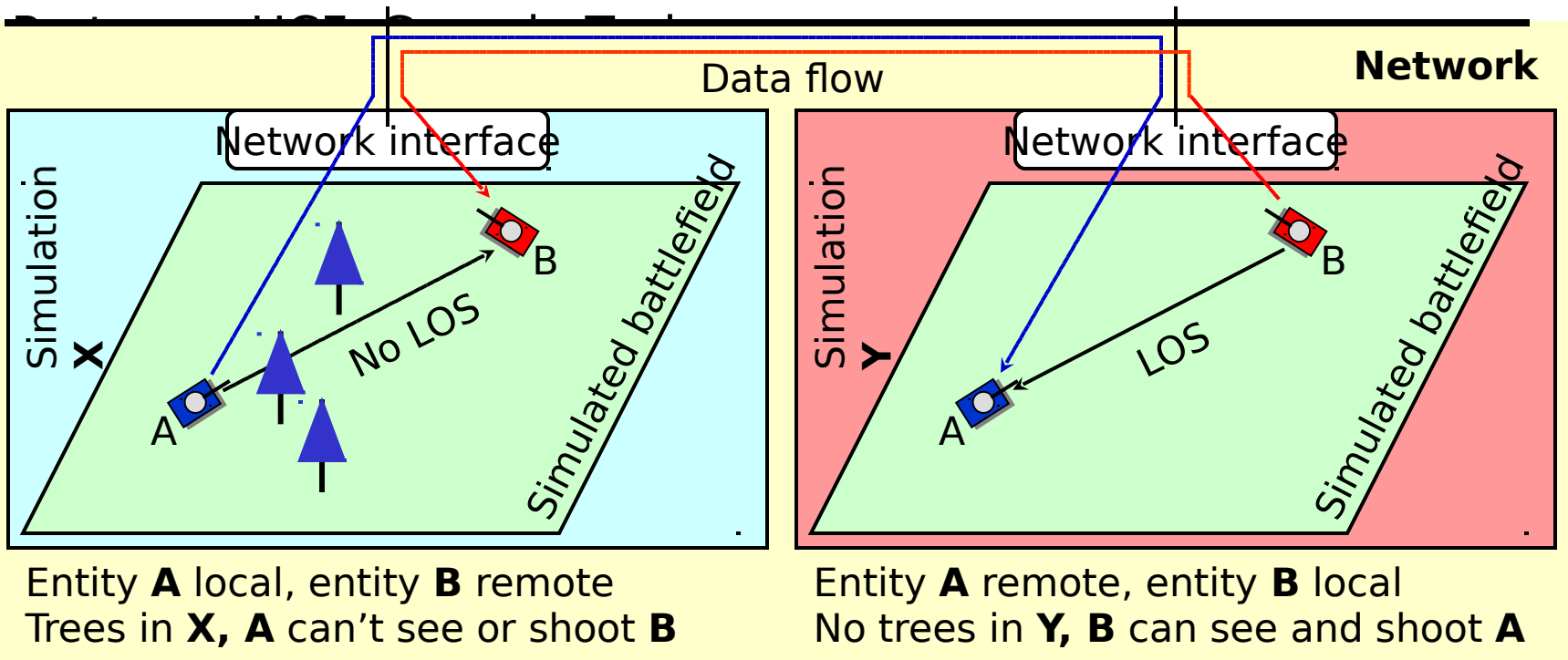


Title: **M&S Education**

Project: Develop an M&S Body of Knowledge; develop and deliver

generic and custom M&S courses

Sponsors: U.S. Navy COTF; CSC; Booz Allen Hamilton; DMSO; NIA



Title: **Joint Professional Military Education (JPME)**
Project: Advise on approaches to use M&S in JPME to enhance training for joint environments
Sponsor: U.S. Joint Forces Command
Partner: ODU College of Education
Status: Complete 2003

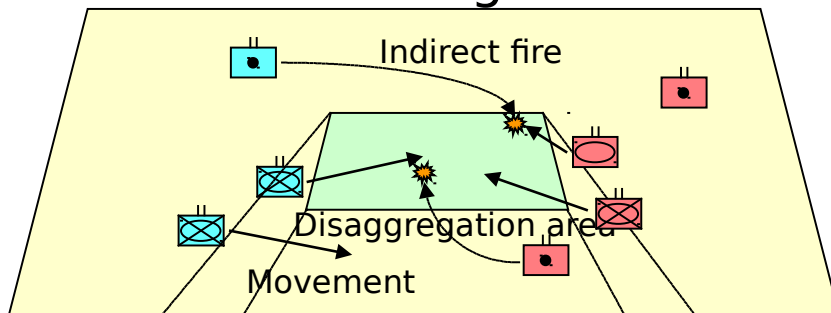


Title: JWARS-JSAF Multi-Resolution Simulation Assessment

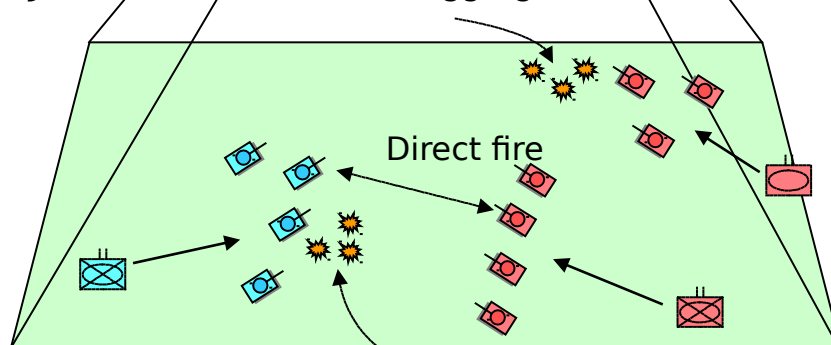
Project: Develop and execute assessment methodology for JWARS-JSAF multi-resolution simulation system

Sponsor: Lockheed-Martin

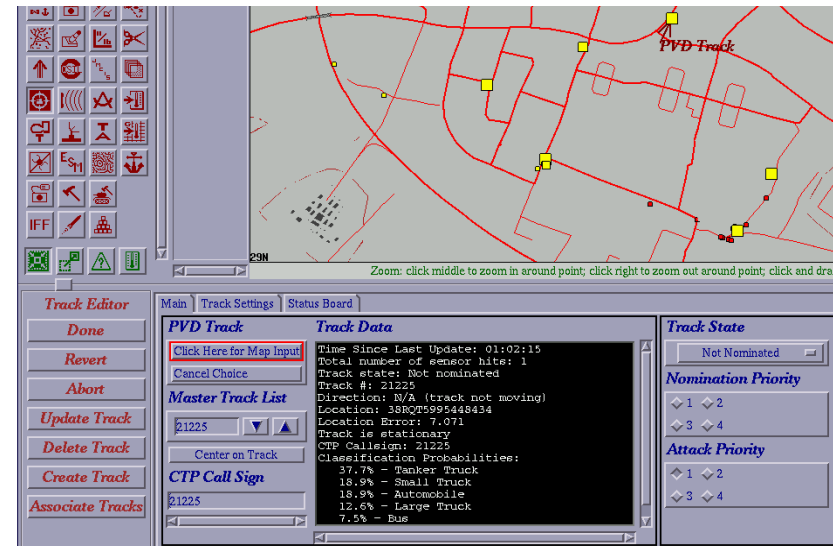
Status: Pending



JWARS; Low-resolution, aggregate battlefield



JSAF; High-resolution, disaggregate battlefield



Title: **M&S of Space Radiation Effects**

Project: Model (for prediction) space radiation effects on humans

for long-duration missions (Space Station, Lunar, Mars, . . .);

use simulation to improve the design of spacecraft to

mitigate the effects of space radiation

Sponsor: NASA (potential)

Status: In planning

Partners: Eastern Virginia Medical School; NASA/LaRC



**www.vmasc.odu.
edu**

bloftin@odu.edu